

## REMARKS

In the Office Action dated October 5, 2005, claims 36 and 42 were provisionally rejected under the judicially created doctrine of obviousness type double patenting as being unpatentable over claim 16 and 22 of co-pending application Serial No. 10/614,601. Claims 1-4, 7-9, 12, 15-18, 36, 39-43 and 45 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Pineda et al. 6,551,396 patent (Pineda) in view of U.S. Patent No. 2,968,848 to Carter et al. (Carter). Claims 6 and 44 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pineda in view of Carter and further in view of either Japanese Patent Publication No. JP 61-245938 or U.S. Patent No. 6,416,572 of Eldemallawy et al. (Eldemallawy). Claims 10-11, 13-14 and 46-50 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pineda in view of Carter and in view of either U.S. Patent No. 5,158,130 to Sahari or U.S. Patent No. 5,915,452 of Conroy et al. (Conroy). Claims 25, 27 and 29-35 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pineda in view of either the Japanese reference or Eldemallawy. Claims 37-38 and 51 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pineda in view of Carter and in further view of U.S. Patent No. 4,580,616 of Watts. For the reasons outlined in detail below, it is respectfully submitted that the pending claims are patentable over the references of record.

The § 103 rejections are respectfully traversed. Each of the rejections will be addressed below.

In paragraph 5 of the Office Action, it was stated that claims 1-4, 7-9, 12, 15-18, 36, 39-43 and 45 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Pineda et al. 6,551,396 patent (Pineda) in view of the Carter et al. 2,968,848 patent (Carter).

### Claim 1

Independent claim 1 and its dependent claims 2-4, 7-9, 12, and 15-18 will be discussed first. In this connection, claim 1 recites a process for the casting of metals including the steps of contacting a mold with a solvent, cooling the molten metal in the mold such that it is partially solidified and removing at least a part of the mold prior to complete solidification of the molten metal into a casting. It is respectfully submitted that there is no teaching or disclosure in either Pineda or Carter, or their combination, of such a method. More particularly, there is no teaching or disclosure in Pineda of a process for the

casting of metals wherein the step of removing the mold begins before the step of solidifying the molten metal has been completed.

Pineda discloses the use of a mold to obtain a casting. Only after the casting has cooled, and only after the mold itself is allowed to cool (see col. 6, line 24), is the mold removed. Such removal is by grinding, sandblasting or the like (see col. 6, line 25). Pineda particularly teaches sandblasting with glass beads (see col. 6, lines 27-28). Alternatively, Pineda teaches dropping a mold into water to create a heat differential between the inner and outer surfaces to crack the mold (see col. 6, lines 29-31). What is clearly missing from Pineda, however, is any teaching or disclosure of removing at least part of the mold, prior to complete solidification of the molten metal in the mold into a casting.

To buttress Applicants' arguments, Applicants herewith submit a copy of a Declaration Under 37 CFR 1.132 which Applicants have submitted in the copending case Ser. No. 10/614,601. This Declaration is by co-inventor John Campbell. Prof. Campbell notes that the teaching of Pineda is to a process in which specified components are used in specified amounts to obtain the right balance of gas permeability, set time and other properties (see paragraph 15 of the Campbell Declaration). In Pineda, the mold is allowed to cool before it is removed, such as by grinding, sandblasting or other means. What is important is that the mold is allowed to cool before the casting is removed. Since the mold is allowed to cool the casting has obviously completely solidified in the mold, before the mold is removed (see paragraph 15 of the Campbell Declaration).

With respect to Carter, this reference is employed in the Office Action for its asserted teaching of the rapid cooling of molten metal via simultaneous molten metal pouring and immersion cooling, for the purpose of forming a fine grain and reducing oxidation pitting for the casting. It was stated that it would have been obvious to one having ordinary skill in the art to provide Pineda with the use of rapid cooling the molten metal as taught by Carter in order to reduce cycle time of casting and refine the cast grain size by partially removing water cooled mold parts of the water dispersible mold. However, Carter also does not teach the removal of the mold during the process of solidifying the molten metal into a casting.

More particularly, as was pointed out during the interview, Carter particularly teaches the immersion of its shell mold 20 into its bath 22 "until the molten metal therein

solidifies and preferably for some time interval thereafter” since this “is important in the practice of the invention” (see col. 3, lines 48-51). It was also noted that Carter particularly teaches that his shell “must be self-supporting in the sense that it can be moved into the liquid coolant” (see col. 4, lines 32-34). Carter further teaches that his poured mold, with the metal in it still in a fluid condition, should be immersed in the body of liquid 22 and it should be maintained in the liquid until the molten metal solidifies (see col. 3, lines 26-27). Thus, Carter fails to teach the step of removing at least a part of the mold prior to complete solidification of the molten metal into a casting, as is recited in claim 1.

To further support Applicants’ arguments, enclosed herewith please find a copy of a second § 132 Declaration submitted in connection with copending case Ser. No. 10/614,601. This one is by Dr. J. Fred Major, a research scientist working for Alcan International Limited (“Alcan”). Alcan is one of the world’s largest producers of primary aluminum and a technology leader in this area. In the enclosed Declaration, Dr. Major states that to his knowledge he has never seen any casting process where the mold begins to be removed before the molten metal has solidified into a casting (see paragraph 5 of the Declaration). He further states that it is highly surprising to him that Alotech (which is the Assignee of the instant application, see the Assignment document recorded on September 10, 2003 at Reel 014480, beginning at Frame 0677) has developed a process for casting in which at least a portion of the mold is decomposed or removed, before the molten metal has completely solidified into a casting.

Quite simply, even the combination of Pineda and Carter does not teach or reasonably disclose the subject matter which is recited in independent claim 1. Neither Carter or Pineda individually, nor their combination, teaches the process of claim 1 including the step of removing at least a part of a mold prior to complete solidification of molten metal into a casting. Moreover, as is evident from the Declarations enclosed herewith, no one in the casting industry, to the declarant’s knowledge had a process for the casting of metals in which at least a part of the mold was removed prior to complete solidification of the molten metal into a casting. Since claim 1 patentably defines over Pineda and Carter, it is in condition for allowance over the asserted combination of references, as well as the remainder of the cited art.

#### Dependent Claims 2-4 and 6-18

Dependent claims 2-4, 7-9, 12, and 15-18 since they merely further patentably define the detailed subject matter of their parent claim or each other are also in condition for allowance over the art of record.

Claim 6 was rejected as being unpatentable over Pineda and Carter in further view of either the Japanese Patent Publication 61-245938 (Japanese '938) or U.S. Patent No. 6,416,572 of Eldemallawy et al. (Eldemallawy). It was stated that either Japanese '938 or Eldemallawy teach the use of an amount of heat resistant and porous or microsphere oxides such as pumice or perlite for the purpose of improving casting shaping quality and mold removability. However, neither of these references teaches or discloses what is missing from the combination of Pineda and Carter, namely, a process for casting metals including the step of removing at least a part of the mold prior to complete solidification of the molten metal in the mold into a casting. Therefore, it is respectfully submitted that claim 6 also patentably defines over the four way combination asserted against it.

Claims 10-11 and 13-14 were rejected under 35 U.S.C. § 103 as being unpatentable over Pineda and Carter in further view of either the Sahari 5,158,130 patent (Sahari) or the Conroy et al. 5,915,452 patent (Conroy). Sahari was said to teach the use of nozzles and submerging the mold into water, for the purpose of cooling and removing the casting for reusing the binder agent. Conroy was said to teach the use of nozzles and flow rate and pressure of fluid including water and surfactant, for the purpose of removing cores from castings. It was stated that it would have been obvious to one having ordinary skill in the art to provide Pineda in view of Carter the use of a water nozzle as taught by Sahari or Conroy in order to control the cooling of the casting in the molten state and remove or crack the water soluble mold from the casting.

Neither Sahari nor Conroy teaches or discloses a process for casting of metals wherein the step of removing the mold begins before the step of solidifying the molten metal has been completed. Sahari particularly teaches that after the cast metal or metal alloy has crystallized, then the mold and any core can be disassembled (see col. 6, lines 11-12). Similarly, in Conroy, the teaching is to the removal of the ceramic cores from turbine blade investment casting (see col. 3, lines 24-26) after the castings have completely solidified. Neither of these patents contemplate that one could remove at least a portion of the mold before the molten metal has completely solidified into a casting. In

this connection, please see paragraph 17 of Dr. Campbell's Declaration. As noted in Dr. Major's Declaration, there simply are no known casting processes wherein the mold begins to be removed before the molten metal has solidified into a casting.

Applicants take this opportunity to amend claim 11. As amended, claim 11 recites that in the process according to claim 1, the step of contacting comprises spraying the mold with the solvent. Similarly, applicants take this opportunity to amend dependent claim 12. As amended, claim 12 now recites that the step of contacting comprises permeating the mold with the solvent. It is respectfully submitted that there is no teaching or disclosure of the processes of claims 11 and 12 in any combination of the cited references.

Accordingly, dependent claim 10-11 and 13-14 also patentably define over the asserted four way combination of references. Reconsideration of these claims is therefore respectfully requested.

#### Claim 25

Claims 25, 27, and 29-35 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pineda in view of either the Japanese '938 patent or Eldemallawy. As is evident from a reading of claim 25, this claim now recites a granular mold material which comprises a mixture of a) pumice, cenospheres, or ceramic, refractory or glass micro-bubbles, b) sand and c) a soluble binder, wherein the binder remains soluble so that the mold may be removed using a solvent. Applicants note that they have amended claim 25 to now recite that the mold is removed using a solvent. No new subject matter is being added as the removal of the mold using the solvent is amply supported by the specification as filed.

In Pineda, the mold is removed by sandblasting with glass beads or by dropping the mold into water, to create a heat differential and crack the mold. Neither of these methods taught in Pineda is the same as or equivalent to removing the mold using a solvent, as is recited in claim 25. Pineda's deficiencies are not cured either by the Japanese '938 reference or by Eldemallawy. Succinctly, none of the three applied references teaches or discloses a soluble binder, wherein the binder remains soluble so that the mold may be removed using a solvent.

#### Dependent Claims 27 and 29-35

Dependent claims 27 and 29-35 were rejected on the same grounds. Since these claims merely further patentably define the detailed subject matter of their parent claim, they are also believed to be in condition for allowance over the applied combination of references, as well as the remainder of the cited art.

However, applicant takes this opportunity to amend claim 30 to recite that the solvent comprises water and that the mold is permeable to water. It is respectfully submitted that there is no teaching or disclosure of the mold of claim 30 in any of the cited art. Accordingly, this claim is patentable over the art of record.

#### Claim 36

Independent claim 36 and its dependent claims 39-42 were rejected as being unpatentable over Pineda in view of Carter. Claim 36 recites, among other things, the steps of contacting at least a part of a mold with a solvent, removing at least a part of the mold and solidifying and cooling at least a part of a molten metal to form a casting. Thus, claim 36 recites that at least a part of the mold is removed prior to the step of solidifying and cooling at least a part of the molten metal to form a casting. As noted previously, there is no teaching or disclosure in either Pineda or Carter, or their combination, of removing at least a part of the mold prior to complete solidification of the molten metal in the mold to form a casting. Therefore, it is respectfully submitted that claim 36 is in condition for allowance for the reasons outlined in detail above. As is clearly pointed in the appended Declarations of Professor Campbell and Dr. Major, to the Declarants' knowledge, there have previously been no processes in which the mold began to be removed before the molten metal has completely solidified into a casting. Thus, claim 36 also patentably defines over not only the art asserted against it but the remainder of the prior art as well.

#### Dependent Claims 37-42

Dependent claims 37 and 38 were rejected as being unpatentable over Pineda and Carter in further view of Watts. Watts was said to teach the use of a solidified shell having a molten metal core while using the shell as a chill for the purpose of controlling the cooling rate and microstructures of the casting. Similarly to Carter and Pineda, Watts teaches a vessel for holding a molten metal while it is being cooled. But, there is no teaching or

disclosure in Watts of removing at least a part of the vessel holding a molten metal, i.e. the mold, before the molten metal has completely solidified and cooled to form the casting. In other words, there is no teaching or disclosure in Watts, or the applied three way combination, of the steps recited in claims 37 and 38. Therefore, it is respectfully that these claims patentably define over the three way combination asserted against them in paragraph 9 of the Office Action.

Dependent claims 39-42 which merely further patentably define the detailed subject matter of their parent claim or each other are also believed to be in condition for allowance, over the art of record for the reasons advanced above.

#### Independent Claim 43

Independent claim 43 and dependent claim 45 were rejected also over Pineda in view of Carter. Applicants have taken this opportunity to amend claim 43. As amended, claim 43 recites a process in which the mold is contacted with a solvent including water and at least a portion of the mold is removed with the solvent while molten metal remains within the shell.

More specifically, claim 43 recites a process for the casting of metals which includes the step of cooling a shell of solidified metal formed at an interface with the molten metal and the mold with a solvent and removing at least a portion of the mold with the solvent while molten metal remains within the shell. There is no teaching or disclosure of such a method in the applied combination of Pineda and Carter or, indeed, in any of the cited art. As clearly noted in the Declarations of Dr. Campbell and Dr. Major, two experts in the art, they have never seen any casting process where the mold begins to be removed before the molten metal has solidified into a casting.

Moreover, as is clearly noted in the Campbell declaration, when the solvent includes water and the molten metal includes aluminum, it is truly surprising and counterintuitive that this process works. Normally, the oxygen in the water reacts violently with molten aluminum and leads to explosions (see paragraph 8 of the Campbell declaration). That is the reason why Professor Campbell believes that the claimed subject matter herein is "the most novel and revolutionary development I have ever witnessed in the casting industry" (see paragraph 9 of the Campbell declaration). As is evident from Professor Campbell's declaration, he is quite expert in the casting art, having published textbooks on casting

(see paragraph 2 of the Campbell declaration). In addition to having published 150 papers on liquid metals, solidification, and casting technology (see paragraph 4 of the Campbell declaration) he was immersed in casting, both at corporations (namely, Triplex Alloys Limited and Cosworth R&D Limited) (see paragraph 3 of the Campbell declaration) and in academia (at the University of Birmingham where he was, for fifteen years, the Professor of Casting Technology) (see paragraph 1 of the Campbell declaration).

Professor Campbell's declaration is further supplemented by Dr. Major's declaration. In this connection, Dr. Major states that the process recited in applicant's claims is "counterintuitive because molten aluminum and water can react vigorously, causing explosions. Therefore, it is highly surprising to me that Alotech has developed a process for casting an aluminum metal in which at least a portion of the mold is decomposed with a solvent including water, before the molten metal has completely solidified into a casting." (see paragraph 7 of the Major declaration).

In view of the foregoing, it is respectfully submitted that claim 43 is in condition for allowance over the asserted combination of references, as well as the remainder of the art of record.

#### Dependent Claims 44-51

Dependent claim 44 was rejected as being unpatentable over Pineda and Carter in further view of either the Japanese '938 reference or Eldemallawy. However, even the asserted four way combination neither teaches nor discloses the method recited in claim 44. In other words, none of the prior art teaches or discloses a casting process wherein the mold begins to be removed before the molten metal has solidified into a casting.

Dependent claim 45, which merely further patentably defines the detailed subject matter of its parent claim is also in condition for allowance over the art of record, for the reasons advanced above.

Dependent claims 46-50 were rejected as being unpatentable over Pineda and Carter in view of either Sahari or Conroy. However, even this four way combination neither teaches nor discloses a process for casting metals in which the mold begins to be removed before the molten metal has solidified into a casting, as recited in claims 46-50. Accordingly, these claims are also in condition for allowance over the art of record.



Finally, dependent claim 51 was rejected as being unpatentable over Pineda and Carter in further view of Watts. However, even this three way combination neither teaches nor discloses a method for the casting of metals in which the step of removing at least a portion of the mold with a solvent begins while a quantity of molten metal is maintained within a shell of solidified metal, formed at an interface of the molten metal and the mold. Therefore, it is respectfully submitted that claim 51 is also in patentable condition over the art of record.

#### Response to Arguments

Page 7 of the Office Action sets forth a paragraph captioned "Response to Arguments". In it, the Examiner states that Applicants arguments are not persuasive because despite the fact that Pineda fails to teach the use of rapid cooling of a molten metal Carter does teach such rapid cooling. It is then argued that it would have been obvious to provide Pineda the use of rapid cooling of a molten metal as taught by Carter. However, the Office Action entirely misses Applicants major contention.

Succinctly, none of the cited or applied art teaches or discloses a process of casting, wherein the step of removing the mold begins before the step of solidifying the molten metal has been completed. This is clearly set forth in the two appended § 132 Declarations. Since there is no teaching or disclosure of any of the prior art of a process wherein at least a portion of the mold is removed before the molten metal has been completely solidified, it is respectfully submitted that all of the pending claims are in condition for allowance over all of the cited and applied references.

#### Claims 36 and 42

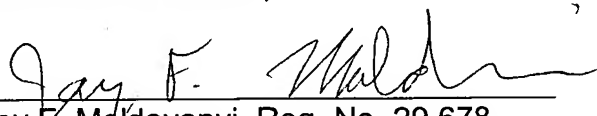
Claims 36 and 42 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 16 and 22 of copending application Ser. No. 10/614,601. This is only a provisional obviousness type double patenting rejection because the conflicting claims have not in fact been patented. If, and when, Ser. No. 10/614,601 issues into a patent, a suitable terminal disclaimer can at that point be filed.

In view of the foregoing, it is respectfully submitted that all of claims 1-4, 6-18, 25, 27, and 29-51 are in condition for allowance. Such allowance is earnestly solicited.

Respectfully submitted,

FAY, SHARPE, FAGAN,  
MINNICH & McKEE, LLP

February 3, 2006  
Date

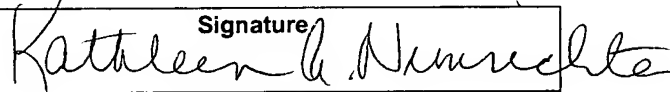
  
Jay F. Moldovanyi, Reg. No. 29,678  
1100 Superior Avenue, Seventh Floor  
Cleveland, OH 44114-2579  
216-861-5582

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